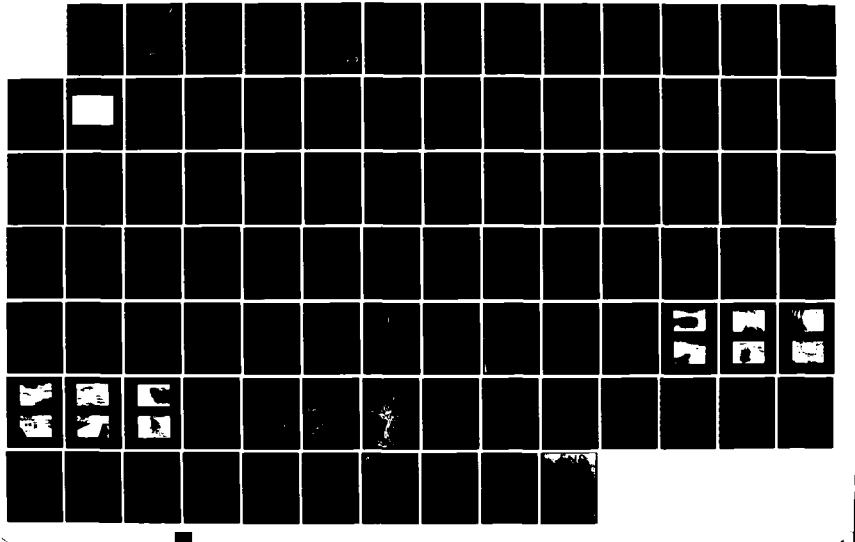
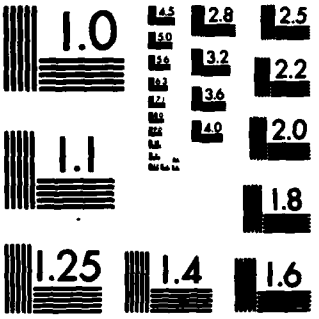
AD-A144 164 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 1/1
SPRINGS POND DAM (CT..(U) CORPS OF ENGINEERS WALTHAM MA
NEW ENGLAND DIV MAR 81

UNCLASSIFIED F/G 13/13 NL





THAMES RIVER BASIN
STAFFORD, CONNECTICUT

SPRINGS POND DAM
CT 00342

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION REPORT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00342	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Springs Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE March 1981 13. NUMBER OF PAGES 55
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Thames River Basin
Stafford, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Springs Pond Dam consists of a 77 foot stone masonry spillway and a 73 foot earth embankment with vertical downstream stone masonry wall. This dam has a maximum height of 14.4 feet with the top of dam 4.4 feet above the spillway crest and is classified as small in size with a hazard classification of significant. Based upon the visual inspection, the dam is in fair condition with some seepage from the downstream face and some deterioration of the south abutment and approach channel for the outlet works.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED

SEP 14 1981

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Springs Pond Dam (CT-00342) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is vitally important.

Copies of this report have been forwarded to the Department of Environmental Protection, and to the owner, Stafford Industrial Properties Trust. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Protection for your cooperation in this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

THAMES RIVER BASIN

STAFFORD, CONNECTICUT

SPRINGS POND DAM

CT 00342

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No:	CT 00342
Name of Dam:	Springs Pond Dam
Town:	Stafford
County & State:	Tolland, Connecticut
Stream:	Middle River
Date of Inspection:	March 10, 1981

BRIEF ASSESSMENT

Springs Pond Dam consists of a 77 foot stone masonry spillway and a 73 foot earth embankment with vertical downstream stone masonry wall. At top of dam elevation, the dam impounds 63 acre-feet. The outlet works consist of a 30" x 42" stone conduit controlled by a wood slide gate. Under normal conditions, the entire flow of Middle River discharges over the spillway. This dam has a maximum height of 14.4 feet with the top of dam 4.4 feet above the spillway crest and is classified as small in size with a hazard classification of significant. There are no available records to indicate when construction of the dam took place or the original purpose of the dam. The visual inspection indicates that the water was used for either power or process water at some time but is no longer used.

Based upon the visual inspection, the dam is in fair condition with some seepage from the downstream face and some deterioration of the south abutment and approach channel for the outlet works. Some trees and brush are growing on the upstream side of the embankment. There are two outlet structures, neither of which is operable. An outlet at the north end of the dam was originally for control of water for downstream use. There no

longer is any apparent need for this outlet. The southerly outlet structure is for use in drawing down the pool.

Corps of Engineers Guidelines recommend a test flood of from 100 year frequency to 1/2 Probable Maximum Flood (PMF) for a dam of this size and hazard classification. Because of the potential for extensive economic losses, a test flood of 1/2 PMF was used. The peak flow for this storm event was calculated to be 6,800 cfs. Because of the relatively small size of the impoundment, surcharge storage only reduces the outflow to 6,770 cfs. The test flood results in the dam being overtopped by 3.1 feet to an elevation of 487.5 NGVD. At top of dam elevation, the spillway capacity is 2,300 cfs, which is 34 percent of the test flood flow.

There are small trees and brush growing on the upstream face with some seepage through the stone masonry downstream wall and deterioration of some stone and concrete masonry.

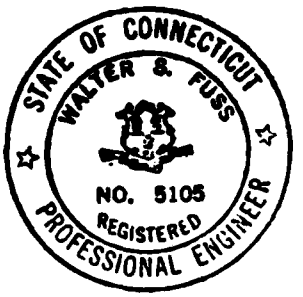
It is recommended that the owner engage the services of a qualified registered engineer to accomplish the following: perform a detailed hydrologic-hydraulic investigation to assess the ability of the dam to withstand overtopping and the means to increase the project discharge capacity; investigate seepage in the downstream face to determine if repairs are warranted; inspect the spillway with the pool drawn down; repair the south outlet gate and north wing wall of the south outlet channel; replace missing stones and repair wall at the south abutment.

In addition, the Owner should institute a regular maintenance program and accomplish the following: remove small trees and brush from the dam; develop an Emergency Action Plan; implement a program of annual technical inspections by a qualified registered engineer.

Recommendations and remedial measures listed above and detailed in Sections 7.2 and 7.3 should be implemented by the Owner within one year after receipt of this Phase I Inspection Report.

FUSS & O'NEILL, INC.

BY: _____
Walter S. Fuss, P.E.
President



This Phase I Inspection Report on Springs Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the

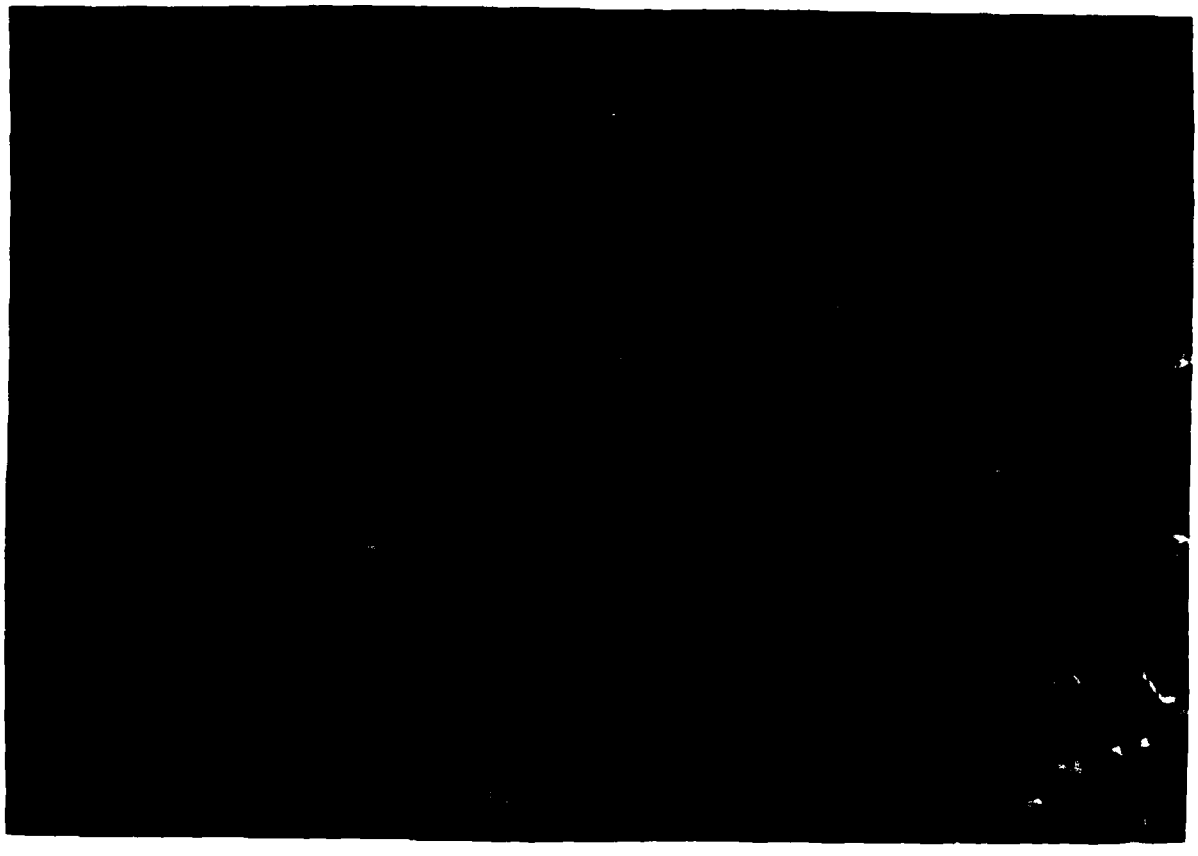
dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there by any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonbly possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

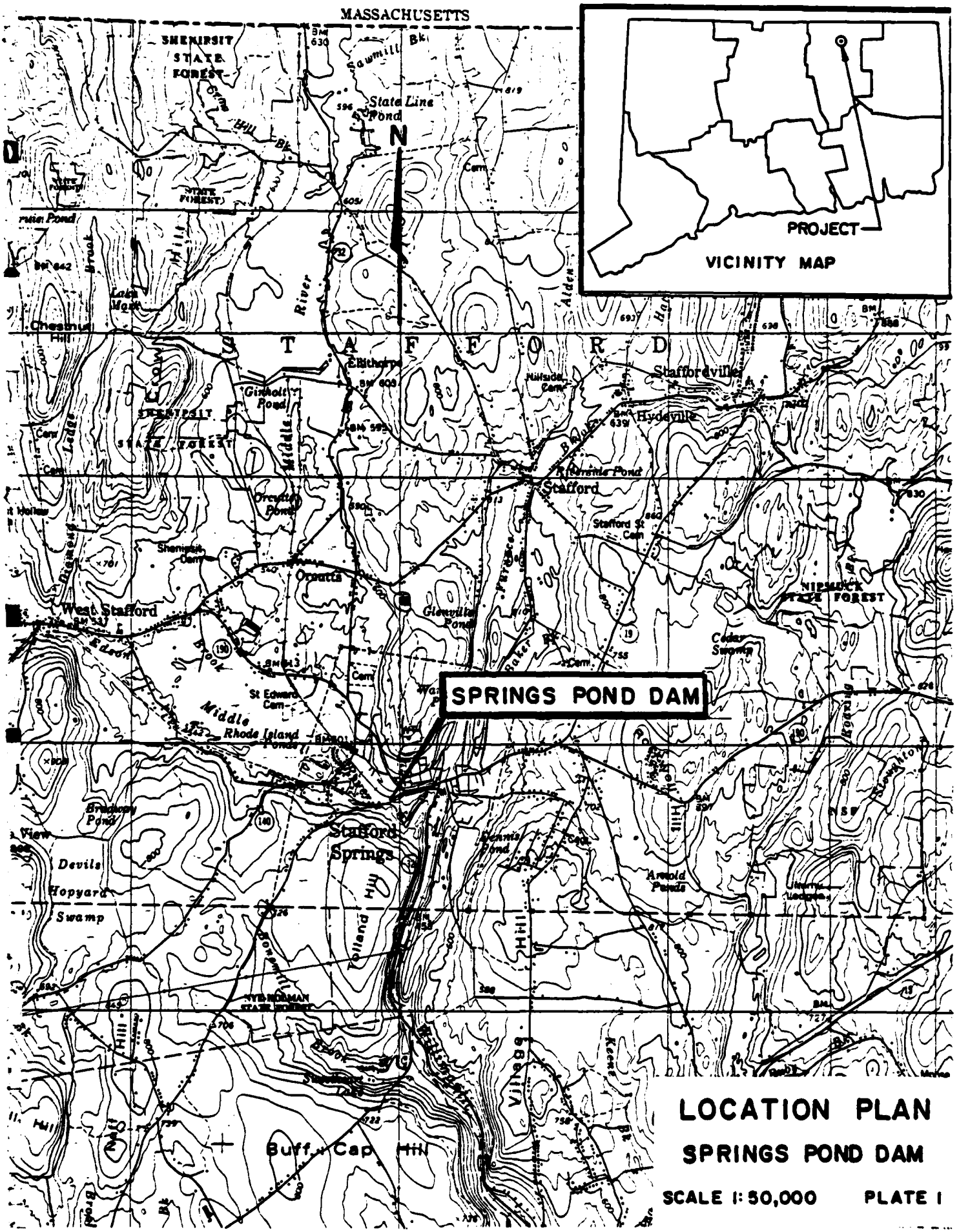
The Phase I Investigation does not include an assessment of the need for fences, gates, no-trepassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

APPENDICES



OVERVIEW PHOTO



LOCATION PLAN

SPRINGS POND DAM

SCALE 1:50,000 PLATE 1

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
SPRINGS POND DAM CT 00342

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL:

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England region. Fuss & O'Neill, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to Fuss & O'Neill, Inc. under a letter of 25 November, 1980 from William E. Hodgson, Jr., Colonel of Engineers. Contract No. DACW33-81-C-0020 has been assigned by the Corps of Engineers for this work.

b. Purpose.

1. Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

2. Encourage and assist the States to initiate quickly effective dam safety programs for non-federal dams.

3. To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION

a. Location. Springs Pond Dam is located in the Borough of Stafford Springs, in the Town of Stafford, County of Tolland. The dam is located at latitude 41°-57.1' and longitude 72°-19.1' and impounds the flow in Middle River. The total watershed of 34 square miles includes six flood control dams and a 180 acre recreational lake. Springs Pond Dam is located just north of Park Street (Conn. Route 140) about 700 feet west of its intersection with Route 32. The impoundment extends northwesterly along the Central Vermont Railroad. About 2300 feet downstream of the dam, Middle River and Furnace Brook join to form the Willimantic River. Approximately 20 miles downstream, the Willimantic River joins the Natchaug River to form the Shetucket River.

b. Description of Dam and Appurtenances. Springs Pond dam is about 150 feet in length with a 77 foot stone spillway. The spillway starts at a stone and concrete abutment at the south end as shown in Photo No. C-4. At the north end, the dam ends at a concrete canal shown in Photos No. C-7, C-8 and C-9. The downstream

face of the dam is stone (Photo No. C-4) with earth fill.

There are two outlet structures both controlled by wood slide gates. Neither gate is operable. The canal at the northerly end of the dam appears to have been constructed for downstream water use, either power or process water. The facility that used the water is no longer in evidence and at normal pool level, the water level in the canal is the same as in the pond. At the gates, the invert of the channel is approximately elevation 477.0.

Ten feet north of the spillway is a second outlet structure with a wooden slide gate as shown in Photo No. C-10. This gate can be used to draw down the pool through a 30" x 42" stone conduit shown in Photo No. C-6. The pool can be lowered to about 3.6 feet below top of spillway. There is no means of lowering the impoundment below this level. A four foot wide concrete channel leads from the pond to the gate. At the gate, the invert of the channel is elevation 467.4.

c. Size Classification. Springs Pond Dam has a height of 14.4 feet from the crest of dam to bed of stream at the spillway. There is a total storage volume of 63 acre-feet at top of dam level. The dam is therefore classified as a SMALL structure in accordance

with the recommended guidelines of the Corps of Engineers which defines a small dam as one with a storage capacity of 50 to 1000 acre-feet or a height of 25 or more but less than 40 feet.

d. Hazard Classification. This dam is classified as having a SIGNIFICANT hazard because of the potential for appreciable economic loss with no loss of life expected. A factory building located from 600 to 900 feet downstream of the dam will have water depths at first floor level of 1.5 feet before failure and 2.0 feet after failure. The estimated water depth due to the assumed breach discharge of 3,600 cfs may range from 6.3 feet just downstream of the dam to 5.6 feet 1,800 feet downstream. Pre-failure depths at these locations would be 5.0 feet and 5.2 feet.

e. Ownership. Springs Pond Dam is owned by:

Ashworth N. Stull & Robert E. Ennis, Trustees
c/o Stafford Industrial Properties Trust
P.O. Box 65
Stafford Springs, CT 06076

f. Operator. No contact has been made with the owners of the dam with letters going unanswered and no telephone listing available.

g. Purpose of Dam. The original purpose of the dam would appear to be either water power or process water. There is no evidence of any recent use of the dam or its impoundment. Without contact with the owners, past or present uses can not be verified.

h. Design and Construction History. No records are available regarding the history of the design, construction and maintenance of Springs Pond Dam.

i. Normal Operating Procedures. No operating records are available. Visual inspection of the dam indicates that both the north and south gates are inoperable.

1.3 PERTINENT DATA

a. Drainage Area. Springs Pond Dam is located in Tolland County in northwestern Connecticut with a 34 square mile drainage basin. There are six flood control dams within the area that control 18 square miles of the watershed. In addition, Crystal Lake a 180 acre recreational lake, controls an additional 3 square miles of watershed. The area is generally rural and rolling with elevations from 480 to 1100 feet.

b. Discharge at Dam Site. There is no history of discharge data available for this dam. Listed below are calculated discharge data for the ungated spillway and the outlet works that can provide the drawdown. There is only minor seepage through the north outlet works.

1.	Outlet Works	
	a. South Outlet - 30" x 42" stone Conduit, Invert Elev. 476.4	
	At top of dam elev. 484.4	110 cfs.
	At test flood elev. 487.5	135 cfs.
	b. North Outlet - 7.4 x 13' concrete channel	Less than 5 cfs.
2.	Maximum known flood	Unknown
3.	Ungated spillway capacity Top of dam elev. 484.4	2270 cfs.
4.	Ungated spillway capacity Test flood elevation 487.5	6635 cfs.
5.	Gated spillway capacity Normal pool elevation	N/A
6.	Gated spillway capacity Test flood elevation	N/A
7.	Total spillway capacity Test flood elevation 487.5	6635 cfs.

8.	Total project discharge Top of dam elevation 484.4	2380 cfs.
9.	Total project discharge Test flood elevation 487.5	6770 cfs.

c. Elevation (feet above NGVD)

1.	Streambed at toe of dam	470.0
2.	Bottom of cutoff	Unknown
3.	Maximum tailwater	Unknown
4.	Normal pool	480.0
5.	Full flood control pool	N/A
6.	Spillway crest	480.0
7.	Design surcharge	Unknown
8.	Top of dam	484.4
9.	Test flood surcharge	487.5

d. Reservoir (Length in feet)

1.	Normal pool	2000'
2.	Flood control pool	N/A
3.	Spillway crest pool	2000'
4.	Top of dam	2200'
5.	Test flood pool	2400'

e. Storage (Acre-Feet)

1.	Normal pool	28

2.	Flood control pool	N/A
3.	Spillway crest pool	28
4.	Top of dam	63
5.	Test flood pool	91

f. Reservoir Surface (acres)

1.	Normal pool	7
2.	Flood control pool	N/A
3.	Spillway crest	7
4.	Test flood pool	10
5.	Top of dam	9

g. Dam

1.	Type	*Masonry face with earth fill*
2.	Length	150'
3.	Height	14.4'
4.	Top width	25'
5.	Side slope	Unknown
6.	Zoning	Unknown
7.	Impervious Core	Unknown
8.	Cutoff	Unknown
9.	Grout curtains	Unknown

h. Diversion and Regulating Tunnel — N/A

i. Spillway

1.	Type	Stone masonry weir
2.	Length of weir	77'
3.	Crest elevation	480.0
4.	Gates	None
5.	U/S Channel	Natural bed
6.	D/S Channel	Natural bed

j. Regulating Outlets

South Outlet

1.	Invert	476.4
2.	Size	30" x 42"
3.	Description	Stone conduit
4.	Control mechanism	Wood slide gate
5.	Other	Inoperable

North Outlet

1.	Invert	477.0
2.	Size	2 slide gates-5'wx7.4'h
3.	Description	Concrete channel
4.	Control mechanism	Two Wood slide gates
5.	Other	Inoperable - originally to control water use, but no longer used for this purpose.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No design data is available for this dam.

2.2 CONSTRUCTION

No record of Construction is available for this dam.

2.3 OPERATION

No operating records are available for this dam.

2.4 EVALUATION

a. Availability. The recorded owners of Springs Pond Dam are Ashworth N. Stull and Robert E. Ennis as Trustees. Their address is a Post Office Box and there is no listed telephone. Letters to their address are unanswered, so no data is presently available.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of the dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on the visual inspection, the dam's past performance, and sound engineering judgment.

c. Validity. The validity of the limited data must be verified.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. Based on visual inspection, the Springs Pond Dam appears to be in fair condition. Although no historical data is available, the dam appears to have been constructed to provide water for either power or processing. Most mill buildings that were associated with the dam have been removed with the exception of the intake building located at the end of the canal about 550 feet below the dam, which is in disrepair with deteriorated gate structures. The canal contains stagnant water and is badly silted.

The left half of the dam is an earth embankment with a vertical stone masonry wall forming the downstream face. A stone masonry wall forms the spillway making up the right half of the dam. A stone masonry abutment at the right end of the spillway joins a concrete retaining wall and wingwall for the bridge carrying Park Street over Middle River. The concrete walls appear to be of much more recent vintage than the dam itself.

b. Dam.

1. Upstream Face - There are several small to medium size trees and brush growing along the earth embankment as shown

in Photo C-3. There is no riprap or other erosion protection along the face of the dam, but erosion does not appear to be a problem. Limited soundings upstream of the spillway indicate a slope of about 5.5:1 but it is not known what part of this slope is due to silting.

2. Crest - Most of the crest of the dam is grass covered with some flat stones in the vicinity of the south outlet channel as shown in Photos C-3, C-4 and C-7. The grass appears to be well established with no bare spots

3. Downstream Face - The downstream face of the dam is stone masonry with the portion above spillway level mortared as shown in Photos C-4, C-5 and C-6. Just north of the end of the spillway and about two feet below top of spillway there is seepage of about 3 gallons per minute through the stone masonry as shown in Photo C-5. There is also some some minor seepage estimated to be less than one gallon per minute just south of and below the drawdown conduit from the south outlet as shown in Photo C-6. The water from both areas appears to be clean.

   Except for the seepage, the stone face appears to be in fair condition.

c. Appurtenant Structures

1. Spillway - The spillway is a 77 foot mortared stone masonry wall with earth behind it. From the visual inspection, it

could not be determined if the earth is from silting or is a part of the original construction. During normal operation, the entire flow of Middle River flows over the spillway. Photos C-3 and C-4 show the spillway from both the south and north ends.

The north abutment is a mortared stone masonry wall extending across the entire width of the dam crest as shown in Photo C-3. This wall appears to be in good condition. The south abutment is also mortared stone masonry as shown in Photo C-4. Downstream of the spillway, there is a concrete wall connecting the abutment wall to the wingwall of the downstream bridge. The downstream six feet of the stone wall is in good condition with the remaining 20 feet in poor condition with one stone out and mortar loose or missing in most joints.

The spillway wall could not be inspected in detail because of the flow, but there were no visible problem areas.

2. South Outlet Works - The south outlet works shown in Photo C-10 can be used for drawdown of the pool to a level of 3.6 feet below spillway crest. Photo C-6 shows the 30" x 42" stone conduit leading from the wood slide gate. A four foot wide concrete channel leads from the pool to the gate.

Although the gate itself appears to be in good condition with little or no leakage, the operating mechanism is missing so the gate is inoperable. The concrete approach channel itself

is in fair condition with minor surface scaling. However, the north wingwall of the channel at the entrance is badly deteriorated as shown in Photo C-11.

3. North Outlet Works - The north outlet works shown in Photos C-7, C-8 and C-9 appear to be the control for the original water use at Springs Pond Dam. The two wood slide gates at the canal intake structure are presently inoperable. From the visual inspection it appears that flow from the pond would not be affected even with the gates removed due to silting of the canal and the reconstruction of Park Street downstream of the dam. The canal appears to be in fair condition.

Some of the wood beams attached to the concrete beams (Photo C-9) are in poor condition. There appears to be some unauthorized pedestrian use of this structure. One of the wood beams for lifting the slide gate is badly rotted. The concrete portion of the approach and discharge channel is in fair condition. The remainder of the canal is in fair condition with small trees lining both sides.

d. Reservoir Area.

No detrimental features in the reservoir area were observed during the visual inspection. The slopes are well covered with growth

and appear to be stable.

e. Downstream Channel

During normal operation, the entire flow in Middle River passes over the spillway. Immediately below the spillway is the single span bridge carrying Park Street over the river. The channel below the spillway has a rocky bottom with small trees and brush along both banks for about 400 feet as shown in Photo C-12. Below this point, there are stone walls bordering the channel on both sides. At the top of the north wall are paved parking areas and drives for a factory building. South of the wall is a Town recreation field including tennis courts and baseball fields.

3.2 EVALUATION

Based on the visual inspection, the overall condition of Springs Pond Dam is fair but with several areas that require attention.

The existing trees and brush along the upstream face of the dam can create future seepage problems and should be removed as well as any future growth on a regular basis.

Visible seepage from the downstream wall north of the spillway should be monitored regularly for the presence of fines as well as for changes in quantity.

Repairs should be made to the south outlet works so that it will become operable and the operation of the gate should be checked on a regular basis since this gate is the only means by which the water level can be lowered. Also, the deteriorated concrete on the north wingwall of the approach channel should be replaced.

During a period of low flow, the south outlet gate should be opened and the pool lowered to below the spillway level and the face of the spillway inspected.

At the north outlet works, the rotted timbers spanning the concrete beams as shown in Photo C-9 are a hazard to unauthorized pedestrians using the area and should be removed completely or replaced. Since this outlet is not a part of the operation of the dam, it is not necessary to make the gates operable.

The abutment at the south end of the spillway should be repaired with the missing stone replaced and the masonry pointed with mortar.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES

a. General. The full flow of the Middle River passes over the spillway of Springs Pond Dam with the existing gates inoperable. There are no known operating procedures in effect at the dam.

b. Description of Any Warning System in Effect. There is no formal downstream warning system in case of emergency at the dam.

4.2 MAINTENANCE PROCEDURES

a. General. Maintenance of the dam appears to be generally lacking.

b. Operating Facilities. There are no operating facilities at the dam.

4.3 EVALUATION

A regular maintenance plan should be developed for removal of small trees and brush and replacement of defective or deteriorated appurtenances.

The inoperable south outlet gate should be repaired and a program of regular operational checks developed and implemented.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL

Springs Pond Dam is a 150 foot long earth dam with a vertical stone masonry wall on the downstream face. Included in this length is a 77 foot long spillway. The maximum head at the spillway is 4.4 feet before the dam is overtopped. A wood slide gate discharging through a 30" x 42" stone conduit is inoperable.

The 34 square mile watershed is rolling and generally rural. Included in the watershed are six SCS flood control dams and a 180 acre recreational lake. A total of 21 square miles of the watershed are influenced by these impoundments. Construction of the flood control dams resulted from severe flooding of the Borough of Stafford Springs in 1955. Springs Pond Dam is located within the Borough of Stafford Springs.

The estimated storage volume at spillway crest is 28 acre-feet and at top of dam elevation it is 63 acre-feet.

5.2 DESIGN DATA

No specific data is available for this watershed of the structure at Springs Pond Dam. In lieu of existing design information, U.S.G.S. Topographic Maps (Scale 1"=2,000') were utilized to develop hydrologic parameters. Some of the pertinent hydraulic design data was obtained

by actual field measurements at the time of the visual field inspection.

Also used were rainfall/discharge relationships developed by the United States Department of Agriculture, Soil Conservation Service in connection with the design of the six upstream flood control dams.

5.3 EXPERIENCE DATA

No historical data for recorded discharges or water surface elevations is available for this dam or the watershed.

5.4 TEST FLOOD ANALYSIS

Approximately 53 percent of the watershed for Springs Pond Dam is influenced by six flood control dams and another 9 percent is influenced by available storage in a recreational lake. Therefore, relationships between rainfall and peak river flows developed during the design of the flood control dams was used. Since this information prepared by SCS is available for Middle River at Springs Pond Dam, it is felt that more accurate results can be obtained with this information than with other approximate methods for a unique watershed such as this.

Based on recommended guidelines of the Corps of Engineers, this dam is classified as small in size with a significant hazard potential. Corps of Engineers Guidelines recommend a Spillway Test Flood of 100 year

to 1/2 Probable Maximum Flood (PMF) for a dam with this classification. Because of the potential for extensive economic losses, 1/2 PMF has been used for the Test Flood.

When designing the six flood control dams upstream of this dam, the Soil Conservation Service (SCS) computed the flows at Springs Pond Dam for Storm Diane which occured August 18 and 19, 1955. This storm had runoff averaging 7 inches in the Stafford area. The computed peak flow at Springs Pond Dam with the six flood control dams operating is 5000 cfs.

Based on information in U.S. Weather Bureau Technical Paper No. 40, the Probable Maximum Precipitation for this watershed is 24 inches. The average runoff for this area is 19 inches, which results in a 1/2 P.M.F. of 9.5 inches and a peak flow of 6800 cfs which has been used as the Test Flood.

The effect of surcharge storage on the maximum discharge was calculated using the Corps of Engineers guidelines. It was assumed that the pool was at spillway crest elevation, 480.0 prior to starting the routing. Due to the relatively small surcharge volume (64.5 acre-feet at Test Flood peak flow) the peak inflow of 6800 cfs results in an outflow of 6770 cfs. at elevation 487.5. This elevation is 3.1 feet above the crest of dam.

Storage ratings were computed based on reservoir areas taken from U.S.G.S. Topographic Maps (Scale 1"=2,000') with the assumption that the pool was spillway level at the starting point. The Elevation-Storage Rating Curve is included in Appendix D.

Discharge ratings were computed using dam dimensions obtained from field measurements. It was assumed that the spillway was unobstructed, the south outlet was fully open and flow through the north outlet was negligable. The Elevation-Discharge Rating Curve is included in Appendix D.

The maximum outflow capacity without overtopping the dam is 2300 cfs which represents 35 percent of the test flood peak outflow of 6770 cfs. A total of 95.4% of the capacity is over the spillway with the remainder through the south outlet. With the test flood outflow, the dam would be overtopped by 3.1 feet (Elevation 487.5). With the south outlet fully closed, the dam would be overtopped by 3.2 feet with the test flood peak flow.

5.5 DAM FAILURE ANALYSIS:

With the water surface at top of dam elevation (484.4), the total discharge would be 2300 cfs with a water surface elevation of 475.0 immediately below the dam. Applying the calculated dam failure discharge of 3600 cfs.

will result in a water surface elevation of 467.3. The highway bridge located about 50 feet downstream of the dam will pass the dam failure flow with adequate freeboard.

A large factory building located north of Middle River from 600 to 900 feet downstream of the dam would have the first floor flooded to a depth of about 1.5 feet with the base flow. The dam failure surcharge would increase the depth to about 2.0 feet. A significant increase in damage could result from this added flooding but no loss of life is expected. On the south side of the river in this same area, a Town owned playground would also sustain additional damage due to the increase in water depths.

Base flow of 2400 cfs will remain within the banks of the stream from Spring Street to the junction with the Willimantic River at Station 20+0. The assumed breach flow will remain within the banks of the stream downstream of Station 18+0.

Springs Pond Dam is classified as a significant hazard because there will be appreciable economic loss with no loss of life expected. No homes will be flooded and the factory building which will be flooded to a depth of 2.0 feet will have flooding before the assumed breach.

SECTION 6 - STRUCTURAL STABILITY

6.1 VISUAL OBSERVATION

The field inspection did not reveal any stability problems.

6.2 DESIGN AND CONSTRUCTION DATA

There is no design or construction data available to permit a formal evaluation of the stability of the dam. Thus, the evaluation of stability is based solely on the visual inspection.

6.3 POST CONSTRUCTION CHANGES

The construction of the bridge immediately downstream of the dam included a concrete retaining wall connecting the south abutment of the dam to the wingwall of the bridge. Also, the water usage has been eliminated and use of the discharge canal from the north outlet has been discontinued. No information is available about any other post construction changes.

6.4 SEISMIC STABILITY

Springs Pond Dam is located in Seismic Zone 1 and in accordance with Corps of Engineers guidelines does not warrant further seismic analysis at this time.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Condition. Based on the visual inspection, Springs Pond Dam appears to be in fair condition.

b. Adequacy of Information. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on the visual inspection, past operational performance of the structure, and sound engineering judgment.

c. Urgency. The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be carried out within one year of receipt of this report by the Owner.

7.2 RECOMMENDATIONS

It is recommended that the Owner employ a qualified registered engineer to:

a. Perform a detailed hydrologic-hydraulic investigation to assess further the ability of the dam to withstand overtopping and the need for and the means

to increase project discharge capacity.

b. Investigate areas of seepage in the downstream face of dam to determine if repairs are warranted.

c. During a period of relatively low flow in Middle River, open south outlet gate and lower water level to below spillway level and inspect top and face of spillway wall and determine if earth behind spillway is a part of the original construction or is silt that should be removed.

d. Repair south outlet gate and make it operable.

e. Repair concrete at north wingwall of south outlet channel.

f. Investigate the need to make the north outlet gates operable and repair as required.

g. Determine the need for a low level outlet capable of draining the pond.

h. At the south dam abutment, replace missing stones and repair wall.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedures.

1. Remove trees and brush from earth embankment including roots. Resulting voids shouldbe backfilled with suitable compacted materials.

2. Institute a regular maintenance program including removal of growth on the dam and operational checks of gates.

3. Develop an "Emergency Action Plan" that will include an effective preplanned downstream warning system, location of emergency equipment, materials and manpower, authorities to contact and potential areas that require evacuation and will also include monitoring of the project during flood periods.

4. Institute a program of annual technical inspections by a qualified registered Engineer.

7.4 ALTERNATIVES

The only alternative to the recommendations of Sections 7.2 and 7.3 is the removal of the dam.

APPENDIX A

INSPECTION CHECK LIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Springs Pond Dam DATE 3-10-81

TIME 11:00 a.m.

WEATHER Cloudy with snow flurries, 35°

W.S.Elev. 480.0 U.S. 470.0 DN.S.

PARTY:

1. G. Mirtl, Hydrology & Hydraulics
2. C. Welti, Soils & Geology
3. E. Lang, Structural & Mechanical
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

PROJECT FEATURE	INSPECTED BY	REMARKS
1.	All features inspected by all members of the party.	
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-31

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	
Crest Elevation	484.4
Current Pool Elevation	480.0
Maximum Impoundment to Date	Unknown
Surface Cracks	None
Pavement Condition	No Pavement
Movement or Settlement of Crest	None
Lateral Movement	None
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DIKE EMBANKMENT (cont)	
Trespassing on Slopes	None
Sloughing or Erosion of Slopes or Abutments	Minor erosion from wave action
Rock Slope Protection - Riprap Failures	None
Unusual Movement or Cracking at or near Toes	None
Unusual Embankment or Downstream Seepage	Minor seepage through masonry wall north of spillway
Piping or Boils	None
Foundation Drainage Features	None observed
Toe Drains	None observed
Instrumentation System	None
Vegetation	Some trees and brush

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	Drawdown Outlet System
a. Approach Channel	
Slope Conditions	N/A
Bottom Conditions	Not visible
Rock Slides or Falls	N/A
Log Boom	None
Debris	None apparent
Condition of Concrete Lining	Bad deterioration at northwest corner
Drains or Weep Holes	None visible
b. Intake Structure	
Condition of Concrete	Good
Stop Logs and Slots	Good

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	Sluiceway Outlet System
a. Approach Channel	
Slope Conditions	N/A
Bottom Conditions	Good
Rock Slides or Falls	N/A
Log Boom	None
Debris	Shopping cart and minor debris
Condition of Concrete Lining	Good
Drains or Weep Holes	None visible
b. Intake Structure	
Condition of Concrete	Good
Stop Logs and Slots	Good

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DRAWDOWN OUTLET SYSTEM	
Outlet Gates	Inoperable
Lifting Timbers	Badly rotted

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
SLUICEWAY OUTLET SYSTEM	
Outlet Gates	Inoperable
Lifting Timbers	One good and one rotted

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	None
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	None
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER (cont)	None
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	Drawdown Outlet System
General Condition of Concrete	Good
Rust or Staining	None
Spalling	None
Erosion or Cavitation	None Observed
Visible Reinforcing	None Observed
Any Seepage or Efflorescence	None Observed
Condition at Joints	Good
Drain Holes	None Visible
Channel	Square masonry conduit thru dam in good condition
Loose Rock or Trees Overhanging Channel	N/A
Condition of Discharge Channel	Good

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	Sluiceway Outlet System
General Condition of Concrete	Good
Rust or Staining	None
Spalling	None
Erosion or Cavitation	None observed
Visible Reinforcing	None observed
Any Seepage or Efflorescence	None observed
Condition at Joints	Good
Drain Holes	None visible
Channel	Good
Loose Rock or Trees Overhanging Channel	Small trees
Condition of Discharge Channel	Good

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	None
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete and masonry	Good
Rust of Staining	None
Spalling	None
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None visible

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
b. Weir and Training Walls	
Drain Holes	None visible
c. Discharge Channel	Middle River
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Small trees on north side
Floor of Channel	Good
Other Obstructions	None observed

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	None
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	

PERIODIC INSPECTION CHECK LIST

PROJECT Springs Pond Dam DATE 3-10-81

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

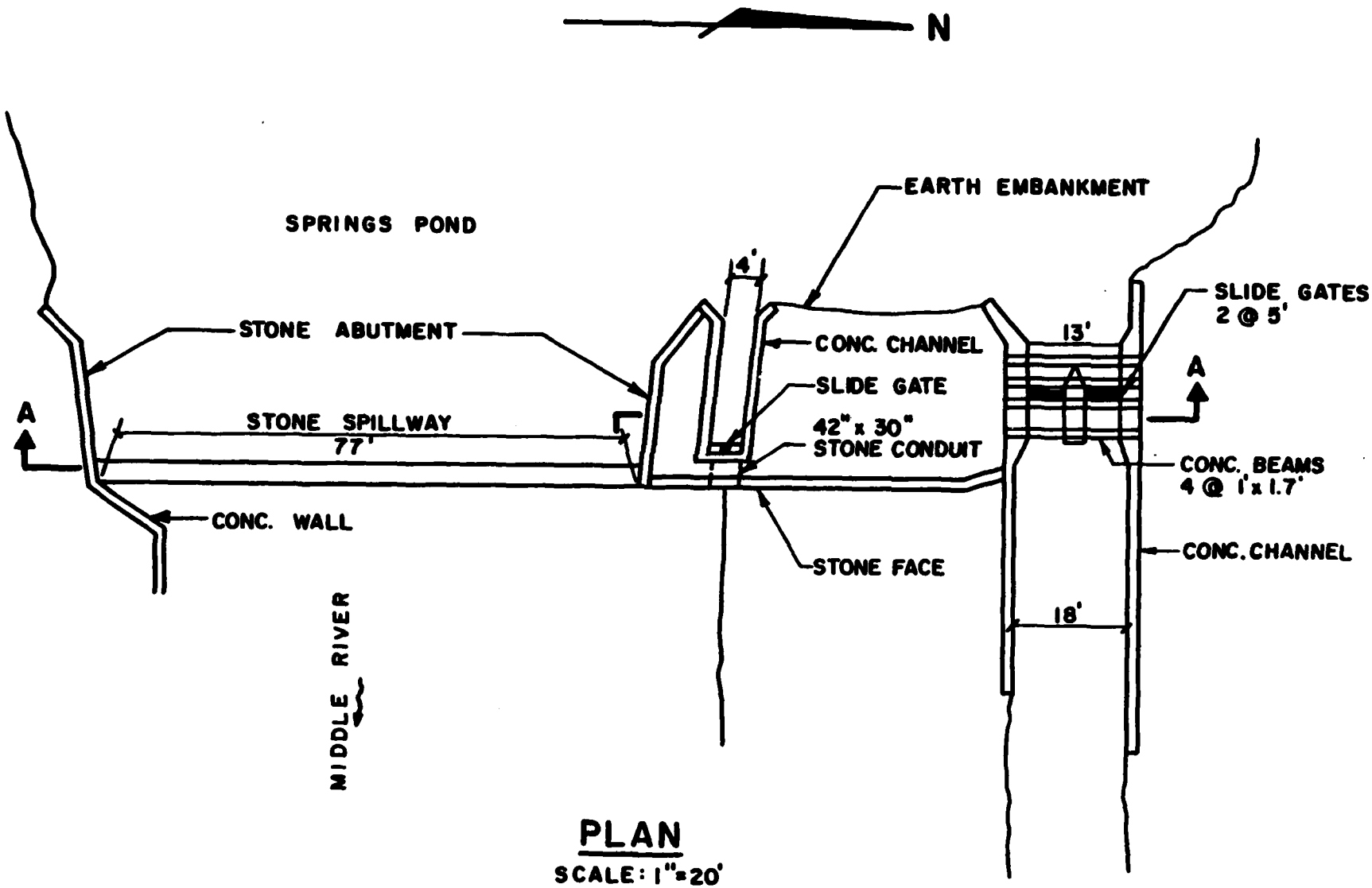
AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE (cont)	None
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

APPENDIX B

ENGINEERING DATA

ENGINEERING DATA

No operating and maintenance records, past inspection reports or correspondence available.

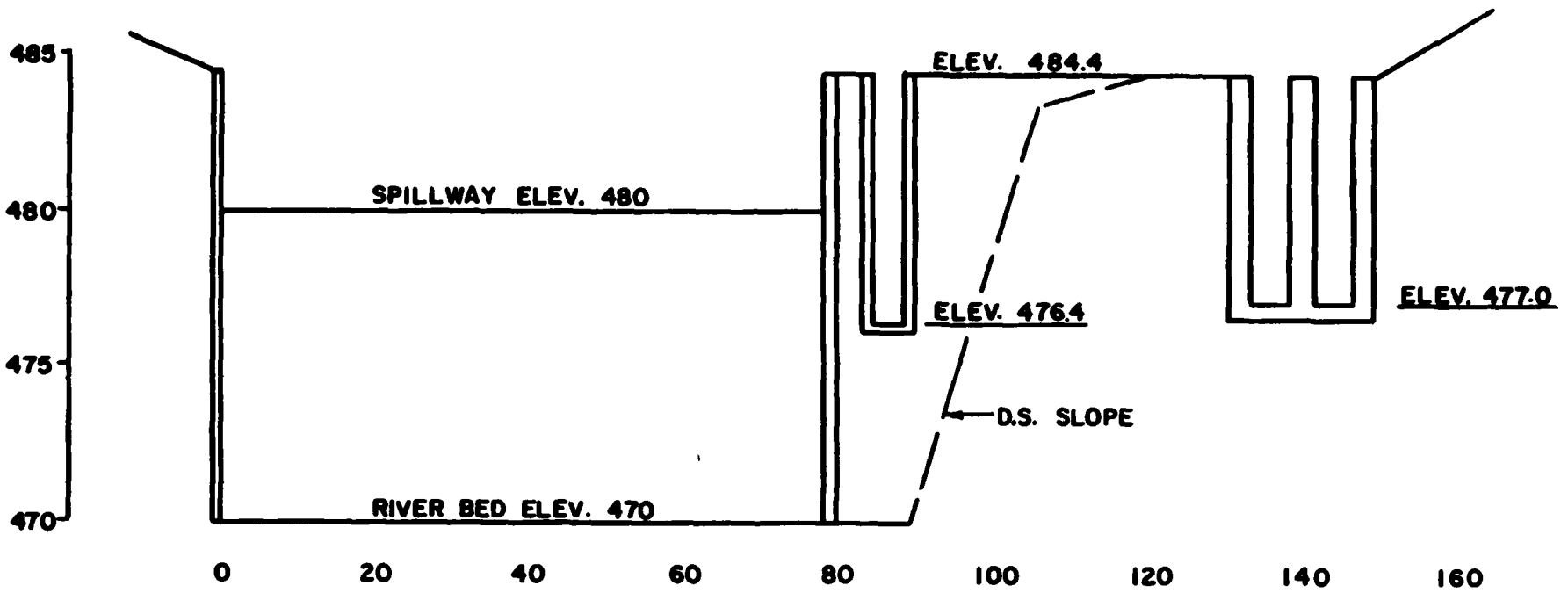


PLAN

SCALE: 1"=20'

SPRINGS POND DAM

PLATE B-1



SECTION A-A

SCALE: 1"=20' HORIZ.
1"= 5' VERT.

SPRINGS POND DAM
PLATE B-2

21 14

RAM CT-342

STATE BOARD FOR THE SUPERVISION OF DAMS
INVENTORY DATA

NAME OF DAM OR POND [illegible] Dam

CODE NO. W240 MR0.4

LOCATION OF STRUCTURE:

Town [illegible]

Name of Stream [illegible] River

U.S.G.S. Quad. Stafford Springs Long. 72°19.1' Lat. 41°57.1'

OWNER: ASHWORTH M. STULL & ROBERT E. ENNIS TRUSTEES 1/80

Address _____

Telephone _____

Pond Used For: RECREATION DA 15.80SM

Dimensions of Pond: Width _____ Length _____ Area ± 9.0

Depth of Water below Spillway Level (Downstream) 8' 10'

Total Length of Dam 145' Length of Spillway 75'

Height of Abutments above Spillway 4'

Type of Spillway Construction ~~Stone~~ cut stone wall ogee crest

Type of Dike Construction OS spillway

Downstream Conditions Stafford Springs

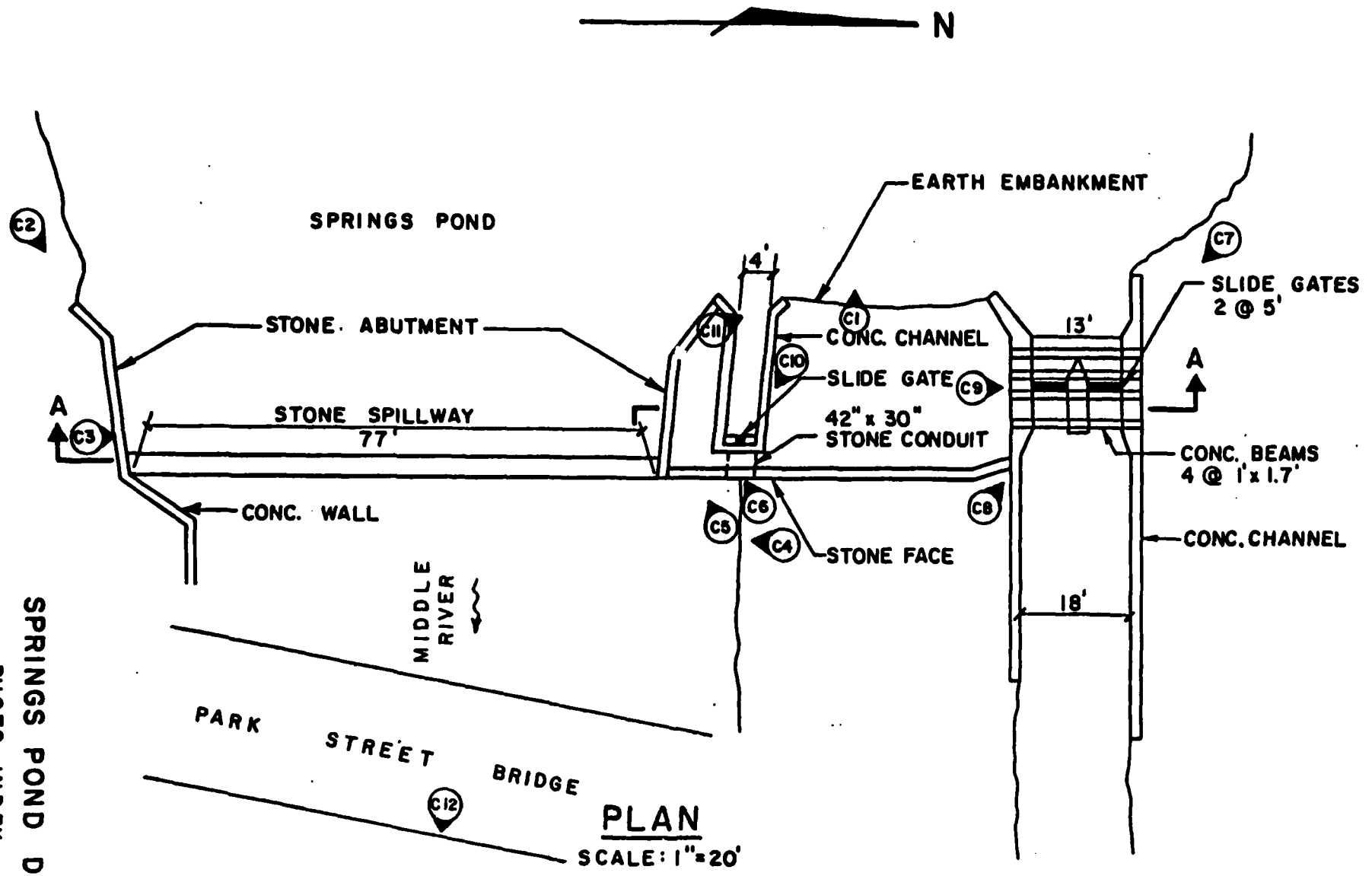
Summary of File Data _____

Remarks _____

1900?

APPENDIX C

PHOTOGRAPHS

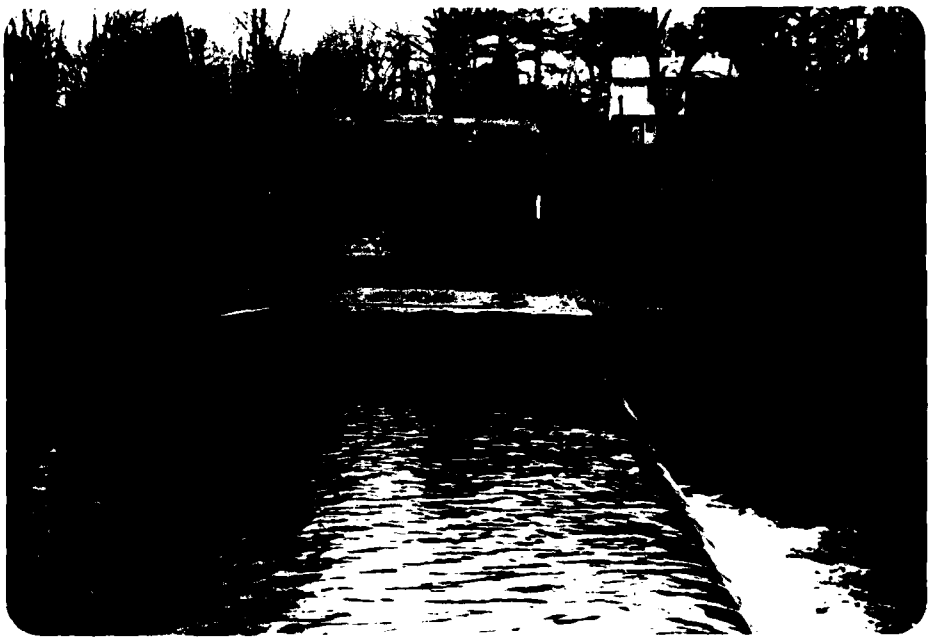


SPRINGS POND DAM

PHOTO INDEX

C-1 UPSTREAM POND

C-2 BRIDGE DOWNSTREAM OF DAM

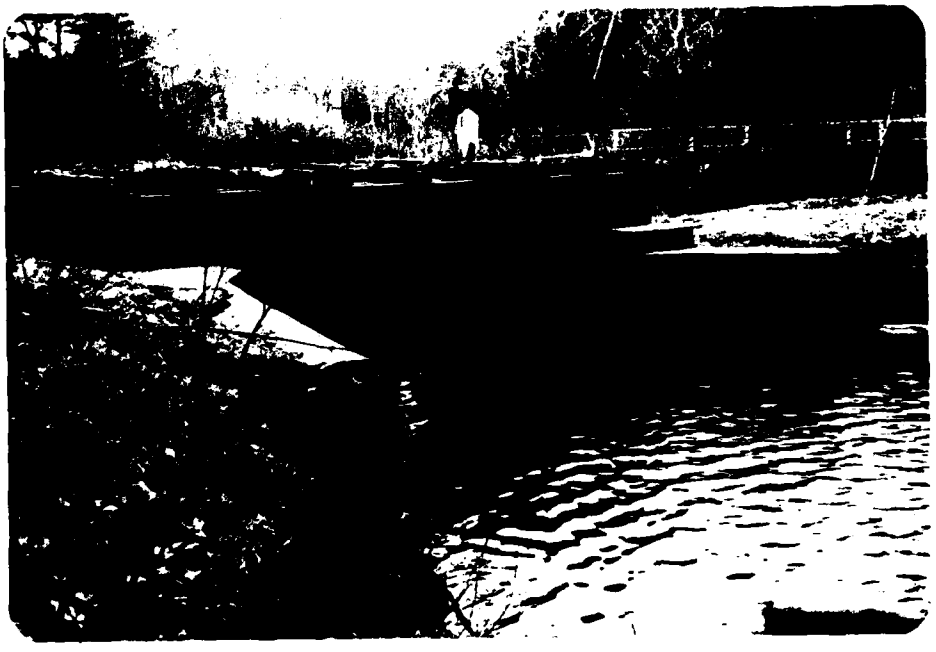


C-3 SPILLWAY LOOKING NORTH

C-4 SPILLWAY LOOKING SOUTH

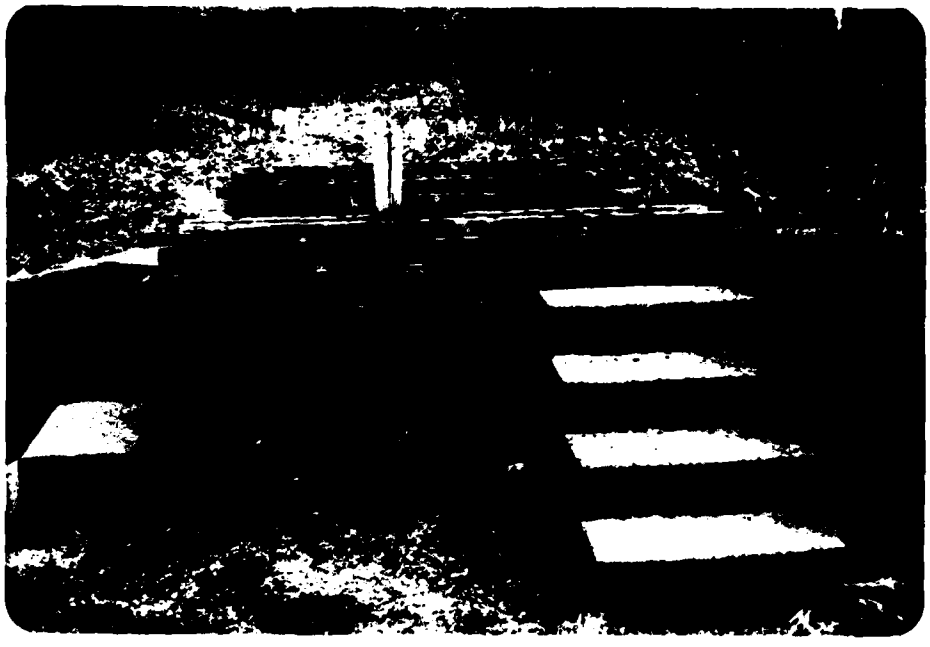
C-5 SEEPAGE DOWNSTREAM FACE OF DAM

C-6 DRAWDOWN CONDUIT DOWNSTREAM FACE OF DAM



C-7 UPSTREAM ENTRANCE TO SLUICEWAY

C-8 DOWNSTREAM FACE OF SLUICEWAY GATES



C-9 SLUICEWAY GATES LOOKING NORTH

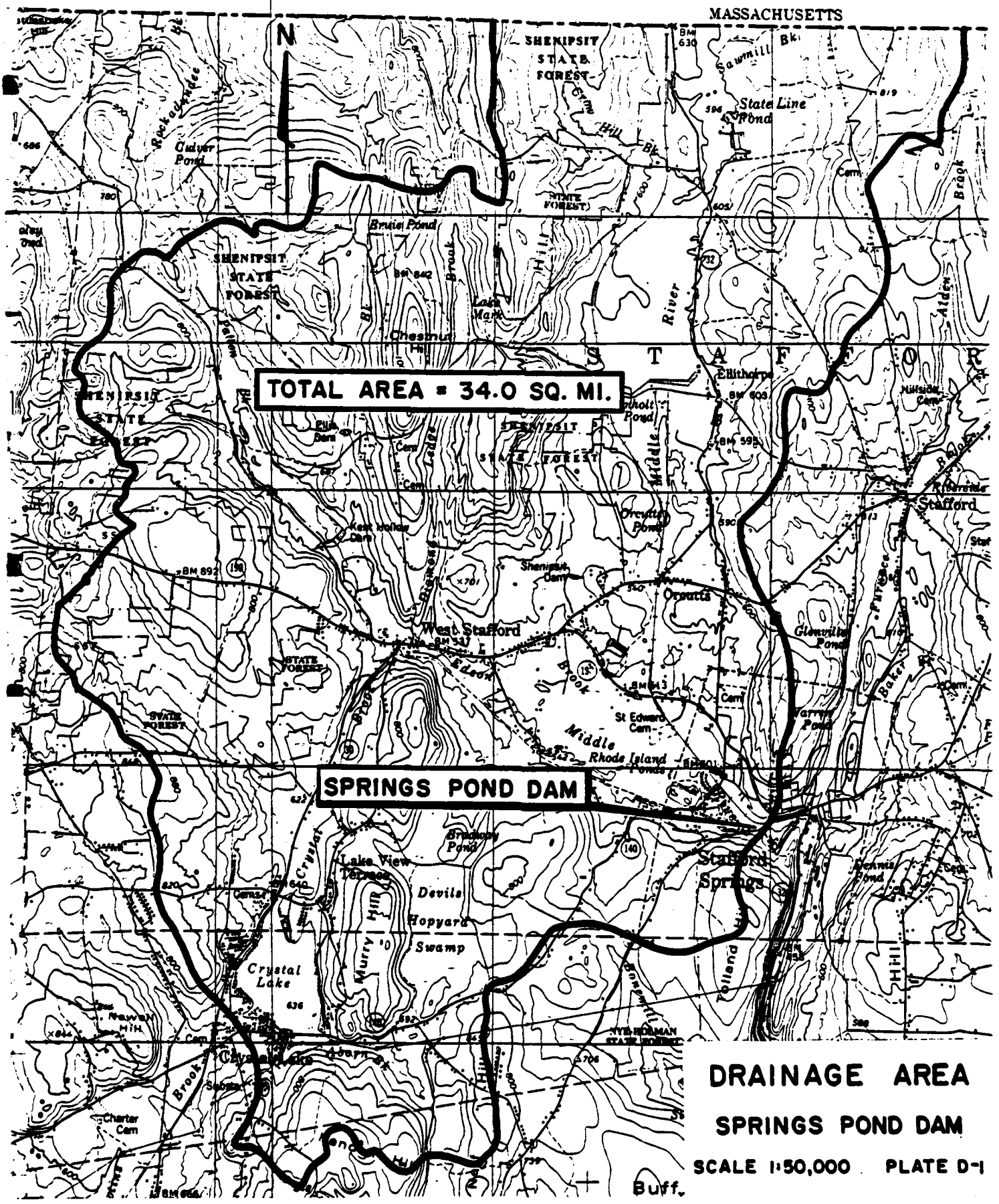
C-10 DRAWDOWN GATE

C-11 ENTRANCE TO CHANNEL TO DRAWDOWN GATE

C-12 MIDDLE RIVER DOWNSTREAM

APPENDIX D

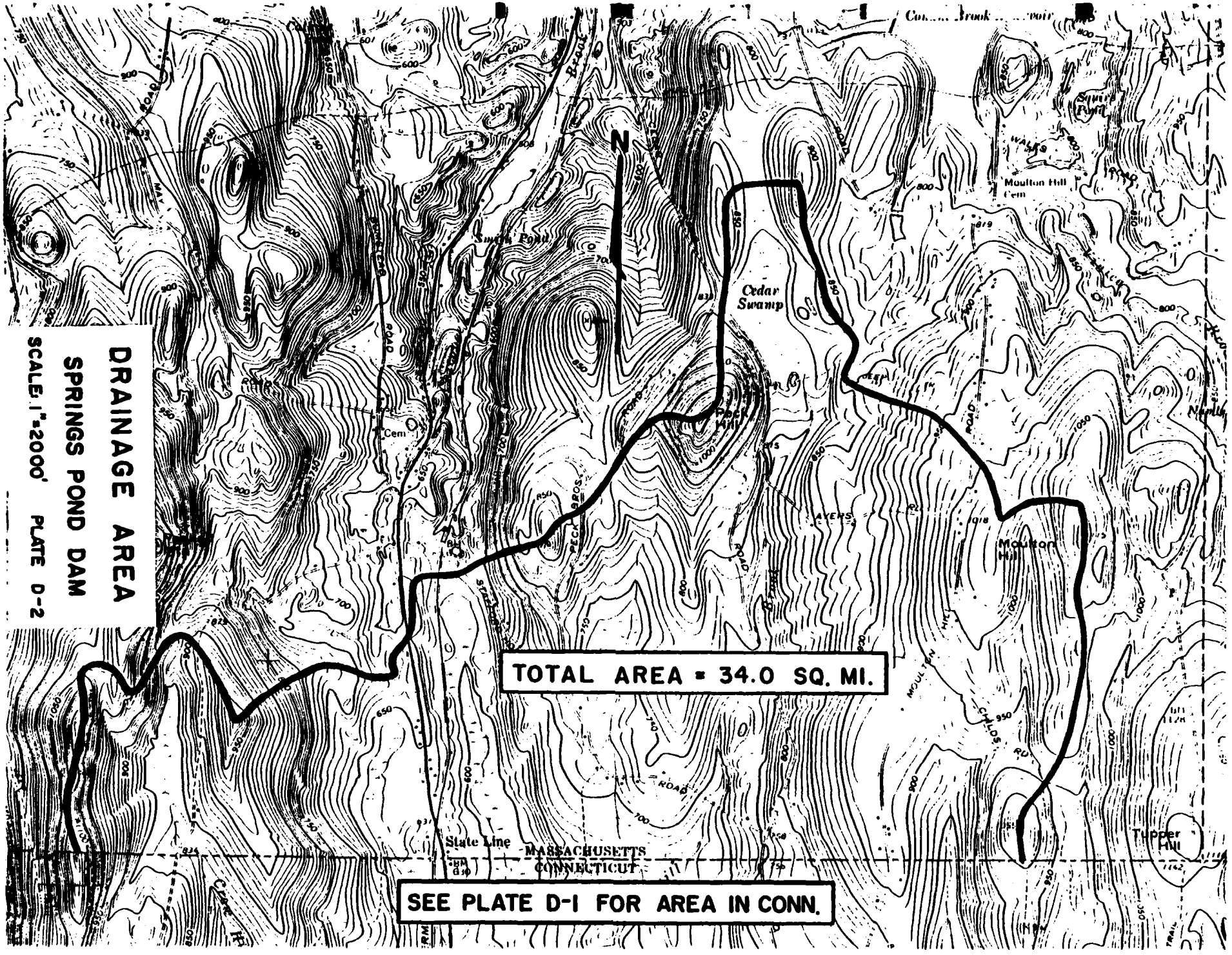
HYDROLOGIC AND HYDRAULIC COMPUTATIONS

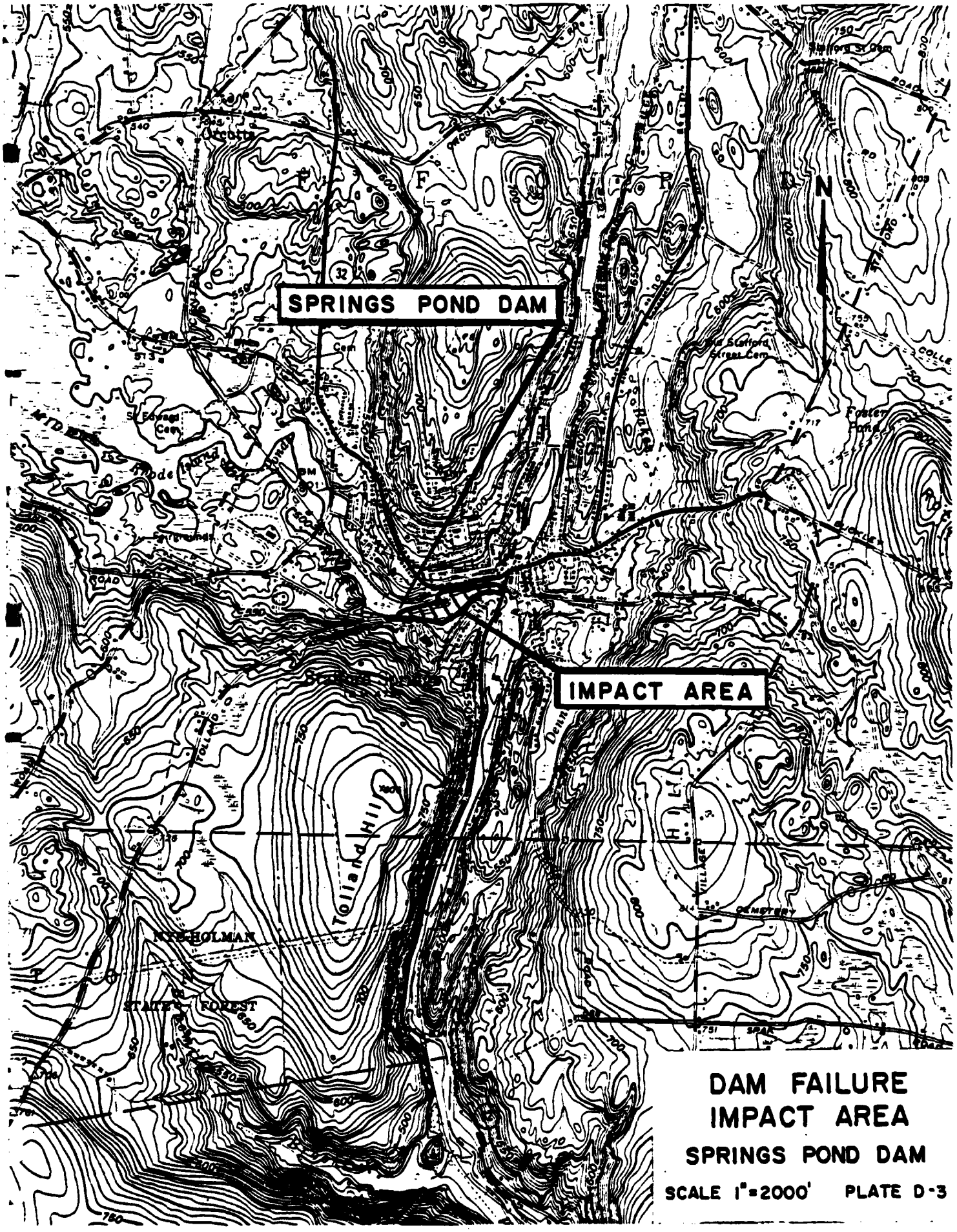


DRAINAGE AREA

SPRINGS POND DAM

SCALE 1:50,000 PLATE D-1

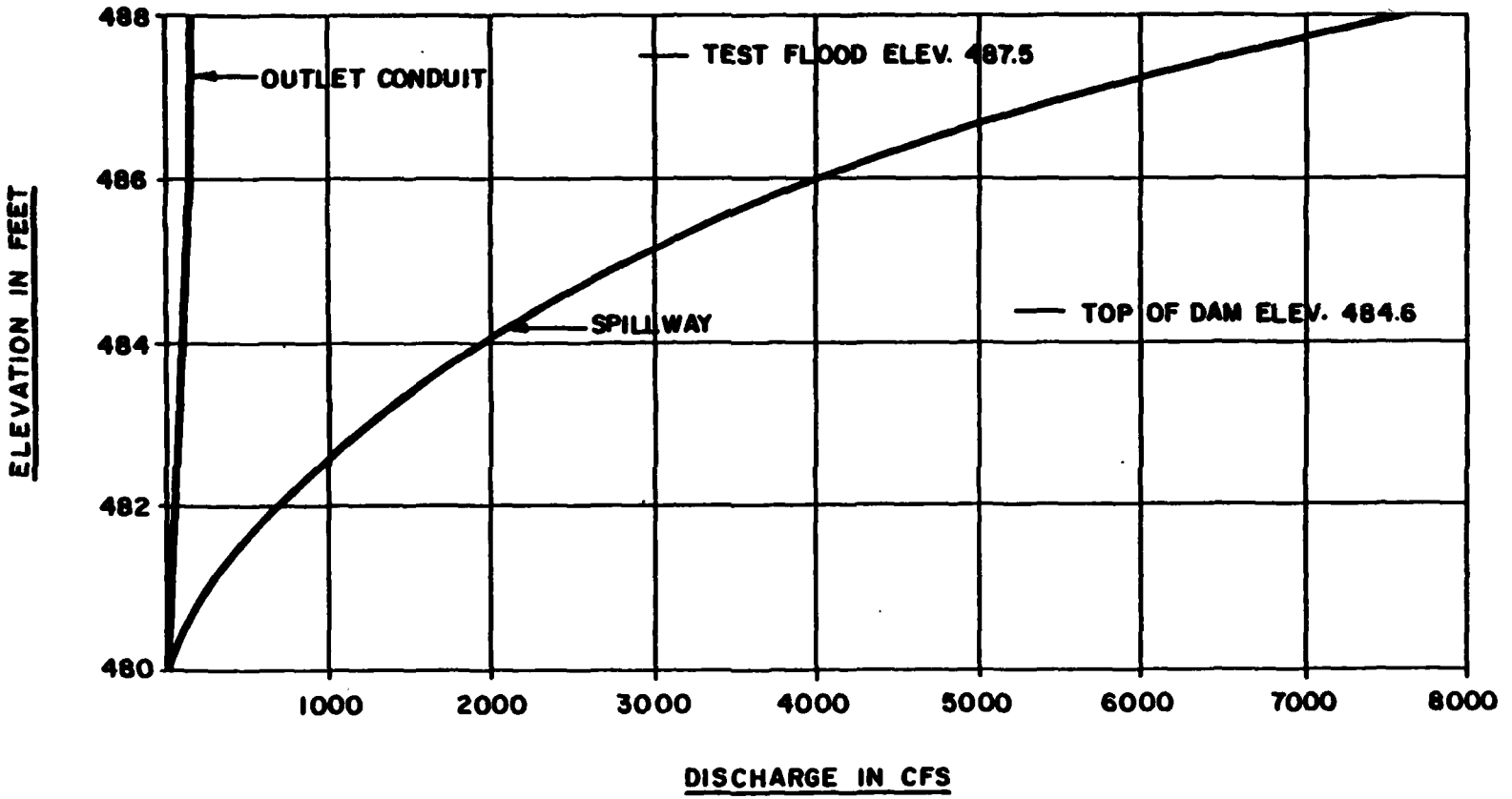

DRAINAGE AREA
SPRINGS POND DAM
SCALE: 1"=2000'
PLATE D-2
N
TOTAL AREA = 34.0 SQ. MI.
SEE PLATE D-1 FOR AREA IN CONN.
State Line
MASSACHUSETTS
CONNECTICUT
Smith Pond
Cedar Swamp
Rock Hill
Moulton Hill
Tupper Hill
Cem
AYERS ROAD
PECK ROAD
STAGE ROAD
CHILDS RD.



DAM FAILURE IMPACT AREA

SPRINGS POND DAM

SCALE 1"=2000' PLATE D-3



SPRINGS POND DAM
SPILLWAY RATING CURVE

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	4/7/81			80-157

SUBJECT: Hydrologic & Hydraulic Computations – Springs Pond

SHEET NO. 1 of 6

Storm flows to Springs Pond come from 8 distinct areas. There are 6 flood control dams designed by the Soil Conservation Service (SCS) and constructed for the Connecticut Department of Environmental Protection in the early 1960's. A seventh area includes the flow to Crystal Lake, a 180 acre existing recreational lake. The eighth area covers all other watershed area draining to the Middle River at Springs Pond. Following is a summary of the 8 areas:

	Area (Sq. Mi.)
SCS Dams	
Whitney	2.9
Ellis	1.5
Pomeroy	1.5
Bradway	1.2
Ellithorpe	10.3
Shenipsit	0.9
Crystal Lake	2.9
Other Areas	12.8
Total	34.0

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	4/7/81			80-157

SUBJECT: Hydrologic & Hydraulic Computations – Springs Pond

SHEET NO. 2 of 6

Peak Flow calculated by U.S. Department of Agriculture, Soil Conservation Service was based on Storm "Diane" which occurred August 18 and 19, 1955. The runoff from this storm averaged 7 inches in this area. The design storm for the 6 flood control dams upstream of Springs Pond was set by the Connecticut Department of Environmental Protection at a rainfall of 15 inches in 6 hours and a runoff of 13.5 inches. The P.M.P. in this area is 24 inches so the design storm exceeds 1/2 P.M.F.

The computed flow at Springs Pond for Storm "Diane" = 5000 cfs with 6 flood control dams upstream.

Average runoff from P.M.P. of 24" in New England is 19". 1/2 P.M.P. = 9.5"

9.5" ÷ 7" × 5000 cfs = 6800 cfs

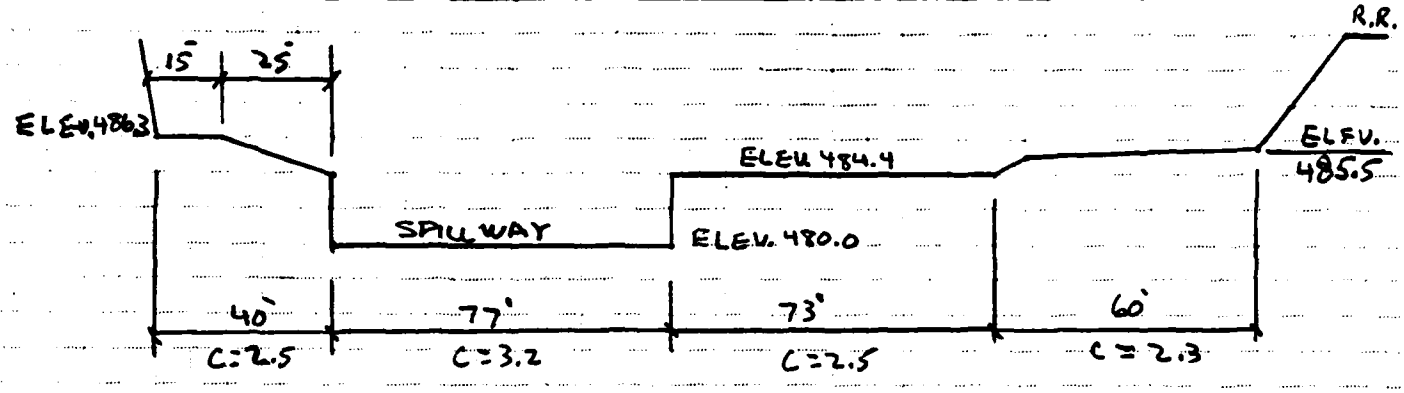
Use 1/2 PMF

TEST FLOOD = 6800 cfs

FUSS&O'NEILL consulting engineers	PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
	GJM	4/10/81			80-157

SUBJECT: Hydrologic & Hydraulic Computations - Springs Pond

SHEET NO. 3 of 6



Ungated Capacity at Top of Dam Elev. 484.4

$Q = 3.2 \times 77 \times 4.4^{3/2}$

$= 2270$ cfs Say 2300 cfs

Capacity at Elev. 485.5

$Q = 3.2 \times 77 \times 5.5^{3/2} + 2.5 \times 14 \times \left(\frac{1.1}{2}\right)^{3/2} + 2.5 \times 73 \times 1.1^{3/2}$

$= 3180 + 10 + 210 = 3400$ cfs

Capacity at Elev. 487.0

$Q = 3.2 \times 77 \times 7^{3/2} + 2.5 \times 15 \times 7^{3/2} + 2.5 \times 25 \times \left(\frac{2.6}{2}\right)^{3/2} +$

$2.5 \times 73 \times 2.6^{3/2} + 2.3 \times 60 \times 1.5^{3/2}$

$= 4560 + 20 + 90 + 770 + 250 = 5690$ cfs

Capacity at Elev. 488.0

$Q = 3.2 \times 77 \times 8^{3/2} + 2.5 \times 15 \times 1.7^{3/2} + 2.5 \times 25 \times \left(\frac{3.4}{2}\right)^{3/2} +$

$2.5 \times 73 \times 3.6^{3/2} + 2.3 \times 60 \times 2.5^{3/2}$

$= 5580 + 80 + 150 + 1250 + 550 = 7610$ cfs

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	4/10/81			80-157

SUBJECT: Hydrologic & Hydraulic Computations – Springs Pond

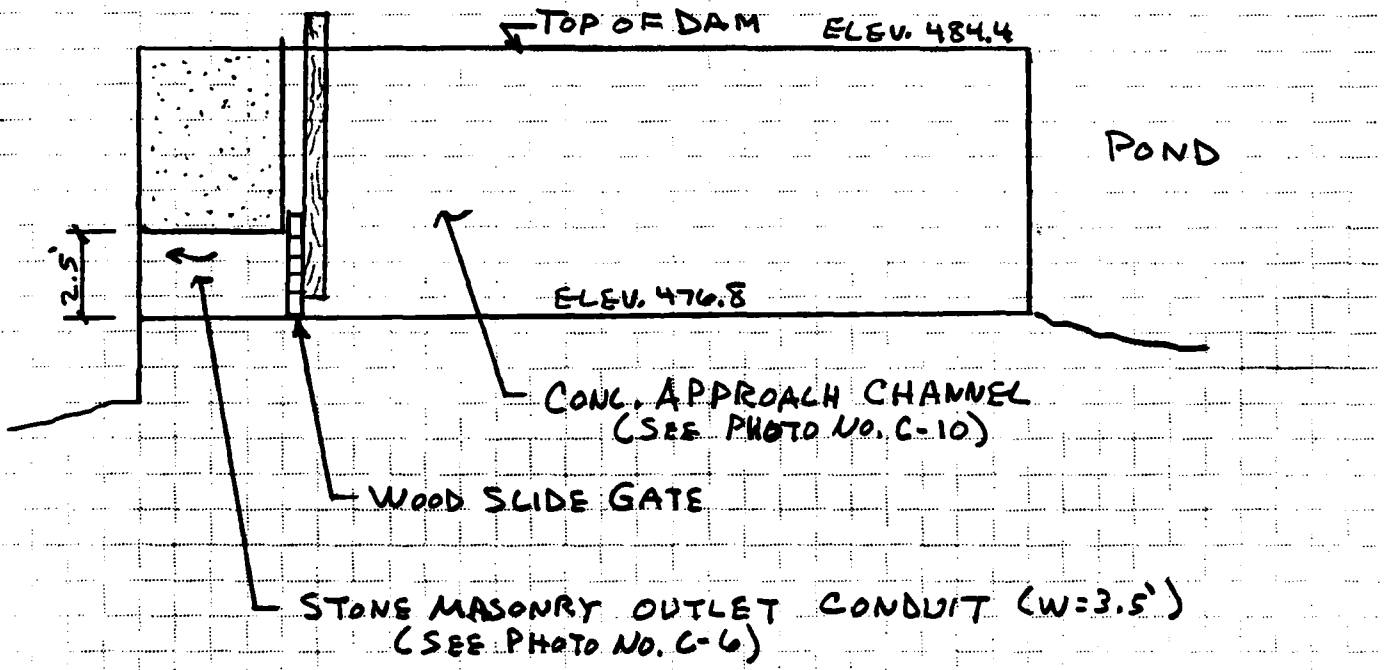
SHEET NO. 4 of 6

Capacity at Elev. 489.0

$$Q = 3.2 \times 77 \times 9^{3/2} + 2.5 \times 15 \times 2.7^{3/2} + 2.5 \times 25 \times \left(\frac{4.6}{2}\right)^{3/2} + 2.5 \times 73 \times 4.6^{3/2} + 2.3 \times 60 \times 3.5^{3/2}$$

$$= 6650 + 170 + 220 + 1800 + 900 = 9740 \text{ cfs}$$

Gated Outlet



Assume Inlet Control

ELEV.	H.W.	Q
484.4	7.6	110 cfs
485.5	8.7	120 cfs
487.0	10.2	130 cfs
488.0	11.2	140 cfs
489.0	12.2	150 cfs

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	4/13/81			80-157

SUBJECT: Hydrologic & Hydraulic Computations - Springs Pond

SHEET NO. 5 of 6

TOTAL CAPACITY

ELEV.	SPILLWAY (UNGATED)	OUTLET WORKS (GATED)	TOTAL
484.4	2270 cfs	110 cfs	2380 cfs
485.5	3400	120	3520
487.0	5690	130	5820
488.0	7610	140	7750
489.0	9740	150	9890

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	4/13/81			80-157

SUBJECT: Hydrologic & Hydraulic Computations – Springs Pond

SHEET NO. 6 of 6

Effect of Surchange Storage

Pond at Spillway Level at Start

Peak Inflow = Q_{P1} = 6800 cfs

Surchange Height to Pass Q_{P1} = 7.5' (Elev. 487.5)

Ave. Area = 8.6 Ac.

Volume of Surchange = 8.6 x 7.5 = 64.5 Ac. Ft

$$= \frac{64.5}{34.0 \times 640} \times 12 = .04 \text{ in. runoff} = STOR_1$$

Use ½ Mat. Probable Runoff = 9.5"

$$Q_{P2} = 6800 \left(1 - \frac{.04}{9.5}\right) = 6770 \text{ cfs}$$

Surchange Height for 6770 cfs = 7.5' (Elev. 487.5)

$STOR_2 = STOR_1$

$\therefore Q_{P3} =$ **6770 cfs**

Stage at Sta. 0+50 (Downstream Bridge) = 479.8

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	4/16/81			80-157

SUBJECT: Dam Failure Hydrograph - Springs Pond Dam

SHEET NO. 1 of 7

Storage - Area at spillway elevation (480.0) = 7.1 Ac.

Average depth = 4.0' x 7.1 = 28.4 Ac. Ft.

Area at dam crest (484.4) = 8.6 Ac.

Volume above spillway = $4.4 \left(\frac{7.1 + 8.6}{2} \right)$ = 34.5 Ac. Ft.

Total Storage = S = 63 Ac. Ft.

Test Flood Pool Elevation = 487.5

Riverbed Elevation at Sta. 0+50 = 470.0

Dam Length at Mid-Height = 98'

Breach Width = W_b = 39'

Y_o = 484.4 - 470.0 = 14.4

$Q_{p_1} = {}^{8}/_{27} W_b \sqrt{g} Y_o^{3/2}$

= 3600 cfs

Spillway Discharge at dam crest elevation = 23.00 cfs

Dam Failure Hydrograph run with starting Q of 3600 cfs with base flow of 2300 cfs in stream for entire reach for pre-failure stage.

FUSS&O'NEILL consulting engineers	PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
	GJM	4/20/81			80-157

SUBJECT: Dam Failure Hydrographs - Springs Pond Dam

SHEET NO. 2 of 7

STAGE / DISCHARGE

Base Flow of 2400 cfs
Slope = 0.318%
n = .030

Station	Elevation	Depth
0+50	475.0	5.0'
3+0	473.2	4.2'
6+0	473.6	5.6'
9+0	472.1	4.1'
12+0	470.4	4.4'
15+0	470.1	5.1'
18+0	469.2	5.2'
20+0	469.2	5.2'

Dam Failure Flow - Assuming no flow in river ahead of wave.
Slope = 0.318%
n = .030

Station	Elevation	Area	Q
0+50	475	320	2400
	479	580	6000
3+0	472	150	820
	475	480	4900
6+0	473	370	1,630
	474	600	3,000
	480	2900	30,000
9+0	471	240	1,570
	473	640	3,100
	478	2320	25,600

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	4/20/81			80-157

SUBJECT: Dam Failure Hydrograph - Springs Pond Dam

SHEET NO. 3 of 7

Station	Elevation	Area	Q
12+0	470	240	1570
	472	580	4400
15+0	470	300	2230
	472	460	5000
18+0	469	300	2230
	470	360	3000

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	4/20/91			80-157

SUBJECT: Dam Failure Hydrograph - Springs Pond Dam

SHEET NO. 4 of 7

STA. 0+50

Q_{P_1} = 3600 cfs
Streambed Elev. = 470
S = 63 Ac. Ft.

Stage = 476.3
Area = 410 S.F.
Vol. = .5 Ac. Ft.

Q_{P_2} Trial: $3600\left(1-\frac{.5}{63}\right) = 3600$

Stage = 476.3
Area = 410 S.F.
Vol. = .5 Ac. Ft.

Q_{P_2} = 3600 cfs

Stage = 476.3

Depth = 6.3'

STA. 3+0

Q_{P_2} = 3600 cfs
Streambed Elev. = 469
S = 63 Ac. Ft.

Stage = 474.0
Area = 375 S.F.
Vol. = 2 Ac. Ft.

Q_{P_3} Trial: $3600\left(1-\frac{2}{63}\right) = 3500$ cfs

Stage = 474.0
Area = 367 S.F.
Vol. = 2 Ac. Ft.

Q_{P_3} = 3500 cfs

Stage = 474.0

Depth = 5.0'

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO
GJM	4/20/81			80-157

SUBJECT: Dam Failure Hydrograph - Springs Pond Dam

SHEET NO. 5 of 7

STA. 6+0

Q_{P3} = 3500 cfs
Streambed Elev. = 468
S = 63 Ac. Ft.

Stage = 474.1
Area = 635 Ac. Ft.
Vol. = 4 Ac. Ft.

Q_{P4} Trial: $3500\left(1-\frac{4}{63}\right) = 3300$ cfs

Stage = 474.1
Area = 621 S.F.
Vol. = 4 Ac. Ft.

Q_{P4} = 3300 cfs

Stage = 474.1

Depth = 6.1'

STA. 9+0

Q_{P4} = 3300 cfs
Streambed Elev. = 467
S = 63 Ac. Ft.

Stage = 473.0
Area = 655 S.F.
Vol = 4.5 Ac. Ft.

Q_{P5} Trial: $3300\left(1-\frac{4.5}{63}\right) = 3000$ cfs

Stage = 472.9
Area = 614 S.F.
Vol. = 4 Ac. Ft.

Q_{P5} = 3000 cfs

Stage = 472.9

Depth = 5.9'

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	4/20/81			80-157

SUBJECT: Dam Failure Hydrograph - Springs Pond Dam

SHEET NO. 6 of 7

STA. 12+0

Q_{p_5} = 3000 cfs
Streambed Elev. = 466
S = 63 Ac. Ft

Stage = 471.0
Area = 417 S.F.
Vol. = 3 AC.Ft.

Q_{p_6} Trial = $3000\left(1-\frac{3}{63}\right) = 2900$ cfs

Stage = 470.9
Area = 400 S.F.
Vol. = 3 AC.Ft.

Q_{p_6} = 2900 cfs

Stage = 470.9

Depth = 4.9'

STA. 15+0

Q_{p_6} = 2900 cfs
Streambed Elev = 465
S = 63 Ac.Ft

Stage = 470.5
Area = 339 S.Ft
Vol = 2 AC.Ft.

Q_{p_7} Trial = $2900\left(1-\frac{2}{63}\right) = 2800$ cfs

Stage = 470.4
Area = 333 S.F.
Vol. = 2 Ac.Ft

Q_{p_7} = 2800 cfs

Stage = 470.4

Depth = 5.4'

FUSS&O'NEILL consulting engineers

PREPARED BY	DATE	CHECKED BY	DATE	PROJECT NO.
GJM	4/20/81			80-157

SUBJECT: Dam Failure Hydrograph - Springs Pond

SHEET NO. 7 of 7

STA. 18+0

$Q_{p7} = 2800$ cfs
Streambed Elev. = 464
S = 63 Ac. Ft.

Stage = 469.7
Area = 344 S.F.
Vol. = 2 Ac. Ft.

Q_{p8} Trial $= 2800 \left(1 - \frac{2}{63}\right) = 2700$ cfs

Stage = 469.6
Area = 337
Vol. = 2 Ac. Ft.

$Q_{p8} = 2700$ cfs

Stage = 469.6

Depth = 5.6'

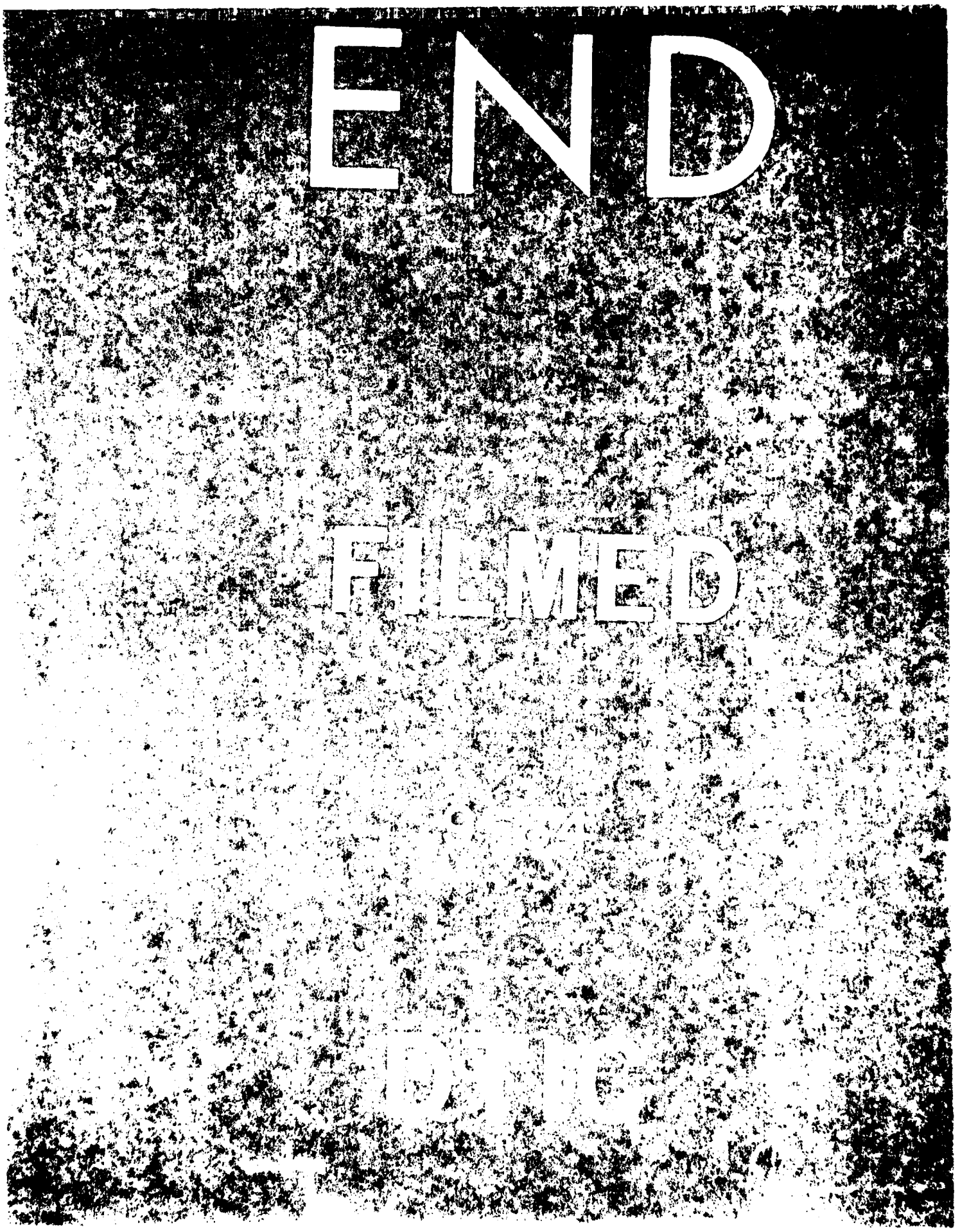
Flood Hydrograph contained within channel banks from 18+0 downstream.

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME


END
FILMED